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NEUTRON PRODUCTS inc

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July 29, 1988

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CENTER FOR
RADIOLOGICAL HEALTH

Mr. Roland G. Fletcher
Director of Radiation Control
Department of the Environment
State of Maryland
201 West Preston Street
7th Floor Mailroom
Baltimore, MD 21201

References: 1. License No. MD-31-025-01
2. State of Maryland, Secretary of Department of the Environment
Order 0-88-01, dated June 23, 1988 and received at Neutron
Products June 29, 1988.

Dear Mr. Fletcher:

Neutron Products' response to the items of the referenced order are set forth below. This response complies with the requirements of Order 0-88-01.

As noted in the response to Items 2 and 3, the design and construction of an improved portal monitor area cannot be accomplished in the 30 days as set forth in Item 3 of the order. Consequently we hereby request an extension of that 30 day period. Also as noted herein, we anticipate being able to establish a schedule for materials procurement and construction on or about August 15, 1988 and will communicate that schedule to the Department at that time. In addition while items of this response have been discussed with Neutron Products' President, Mr. Jackson Ransohoff, he has not been able to review this response. It will be sent to him in Connecticut today for his review. The results of his review and further discussions of them with other Neutron Products' management and staff will be forwarded to the Department early in the week of August 1, 1988, if necessary.

Response to Item 1

The subject incident was discussed by the Neutron Products' Radiation Safety Committee on June 14, 1988. Prior to that meeting a number of discussions took place in which the details of the visit to the Ginn Nuclear Power Station by a Neutron Products' employee were reviewed, the performance of the Limited Access Area portal monitor was evaluated, and various remedies e.g. alternative monitoring locations, monitor shielding and improvements in personnel frisking were evaluated.

In the Radiation Safety Committee meeting emphasis was placed upon modifications to the limited access area portal monitor, since it would involve materials procurement and construction and hence would be a long lead time project, the details of that meeting, subsequent evaluations and design efforts are discussed in the response to Item 3.

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Response to Item 2

While some of our activities in response to the order are ongoing, this response complies with the requirements of this Item. As indicated in the response to Item 3, construction drawings of a revised arrangement for the existing portal monitor area, are being completed and are expected to be received by Neutron Products August 15, 1988. Based upon the receipt, review and approval of these drawings, a schedule for materials procurement and construction will be developed and communicated to the Department.

Response to Item 3

In summary, we have done the following in response to this item.

- (a) Measured the background radiation at the existing portal monitor and frisker station at the exit of the Limited Access Area, determined the effect of background radiation on the sensitivity of the monitoring instruments, and established an objective for reduction of background radiation.
- (b) Installed, as a temporary measure, frisker instruments of increased sensitivity at the exit of the Limited Access Area and at two other, lower background locations in the plant. Ensured proper use of these instruments by personnel exiting the Limited Access Area.
- (c) Evaluated the possibility of relocating the entrance and exit of the Limited Access Area and decided against doing so.
- (d) Developed a revised arrangement for the existing portal monitor area, with added shielding to reduce background radiation at the portal monitor and frisker station. The arrangement has been reviewed and approved by our Radiation Safety Committee and has been given to our architect for development of construction drawings, including necessary footings and structural supports. Construction drawings are scheduled to be complete approximately August 15, 1988, and upon receipt of the drawings we will develop a construction schedule.

These summary statements are elaborated in the following discussion.

Background Radiation

The background radiation at the existing portal monitor is about 0.2 mR/hr. This compares with 0.06 mR/hr or less, at the plant boundary.

In terms of counts per minute (cpm), the background radiation at the portal monitor and frisker station is 2000 ± 500 cpm, when using a scintillation detector with a 1"xl" crystal, and is 200 ± 50 cpm, when using a 15 cm² pancake detector. These same instruments read about 200 cpm and 100-150 cpm, respectively, at the plant boundary, and about 20 cpm and 50 cpm, respectively, in a typical home.

The sensitivity of an instrument depends on what the instrument reads in the presence of a local radiation source, relative to background. For example, with a test source in the form of a 15-16 cm² thin disk having a calibrated strength of 3,800 dpm, no increase in count rate above background was detectable, in the portal monitor area, by the 1"x1" scintillation detectors in the portal monitor and formerly used at the frisker station. In contrast, an increase above background of about 400 cpm was seen by a 15 cm² pancake detector in the frisker station. Given the temporal variation in background and the effects of geometry (e.g., distance of detector from radiation source), a reasonable criterion for detector sensitivity is what can be detected at a level of twice background. On this basis, the pancake probes, which we have now installed at all frisker stations, have the ability to detect about 200 dpm or .0009 uCi of cobalt-60 at the portal monitor area. In the lower backgrounds (about 100 cpm) of the other two frisker locations in the plant, at twice background the detectability limit is about .0005 uCi. Corresponding limits are .0005-.0007 at the plant boundary and .0002 uCi in a typical home.

Our established objective for reduction of background radiation at the portal monitor area is that the background should be about as low as in an employee's home. This will comply with the value stated in your Order and may, in practice, not be achievable. But it has been the basis for determining how much new shielding material will be installed.

We intend to replace the existing portal monitor with an Eberlein PMP-4 monitor, which has a self-compensating background measurement. As the detectors in the monitor react primarily to gamma radiation, our objective for reduction of background radiation is a factor of 100, based on measurements made with our 1"x1" scintillation detectors.

Increased Sensitivity of Frisker Stations

We have installed Ludlum 177 count-rate meters with 15 cm² pancake probes at the frisker station adjacent to the portal monitor, at the frisker station in the main lobby, and at a frisker station in an office on the second floor of the west wing. As discussed above, this provides increased sensitivity to detect cobalt-60 contamination on persons, their clothing, and objects they may be carrying.

We have instructed employees, who work in the Limited Access Area, regarding use of the frisker at the portal monitor whenever leaving the Limited Access Area and use of one of the other two friskers prior to leaving the plant at the end of the day (or whenever leaving the plant, e.g., for lunch). These procedures are being followed.

We are also evaluating the potential advantages of having Limited Access Area employees frisked by another person at the end of each day.

These actions regarding the frisker stations provide reasonable assurance against release of contamination from the plant in the interim while we reconstruct the portal monitor area.

Possible Relocation of the Portal Monitor Area

We have surveyed and evaluated other possible locations for the entry to and exit from the Limited Access Area. Other locations, e.g., on the second floor or near the welding shop, would be significantly less convenient and provide no significant reduction in background radiation. We have therefore decided to retain the existing area for entry, exit and portal monitoring.

Rearrangement of Portal Monitor Area

The planned rearrangement of the portal monitor area is shown in the attached sketch. The rearrangement preserves separate one-way entry and exit doors for access control. It also provides from 2 to 5" of steel, generally wrapped around the portal monitor, and a labyrinth through which personnel will leave the area. All passages are at least 30" wide and many are 36" wide. An advantage over the existing arrangement is that a person with contamination can return to wash up without passing through the exit door.

The locations and thicknesses of steel shielding are based on the locations of major radiation sources in the Limited Access Area. A thickness of 5" of steel is provided directly between the portal monitor and Limited Access Area to reduce direct gamma radiation by a factor of 100. This wall shields against sources between the main pool and hot cell, near the hot tool room, and in the radwaste storage areas. The steel thickness is reduced to 3" on the wall of the sample counting area, which is generally between the portal monitor and main pool, in recognition of shielding provided by several intervening concrete block walls and smaller source strengths near the pool. The 3" thick wall parallel to the windows shields against sources in the courtyard, e.g., radwaste handling, and may be thicker than necessary. A 2" thick steel roof is protects against elevated sources, e.g., the hot cell air exhaust system, and scattered radiation.

As discussed earlier, we intend to replace the existing portal monitor with an Eberline PMP-4 portal monitor, which has automatic background subtraction, and hence should be more sensitive. If our expectations are not realized, the arrangement of walls and shielding is such that a different type of personnel monitor, e.g., a hand and foot monitor, could be located within the exit labyrinth.

During construction of the new entry/exit area it will be necessary for personnel to enter and leave the Limited Access Area at a different location. We will inform you of our plans in that regard when we submit our schedule for reconstruction of the portal monitor area.

Response to Item 4

At this time the homes and automobiles of twenty-two employees have been surveyed by personnel of Maryland Center for Radiological Health. Follow-up surveys of five of these homes and automobiles have been made by qualified Neutron Products' employees. Eleven other employees have chosen to have a two

man Neutron Products' survey team survey their homes and automobiles. At this time seven of these homes and automobiles have been surveyed. All surveys of the thirty three homes and automobiles will be completed by August 5, 1988. A copy of the survey guidelines, developed by Neutron Products' for these surveys, is enclosed. The results of these surveys as of June 28, 1988 have been reviewed by a Department employee.

Response to Item 5

In a letter to Mr. Roland G. Fletcher from Jackson A. Ransohoff dated June 29, 1988 a request was made to use probes with a window density of 1.5 to 2mg/cm². Comparison of probes with these windows with those that were used by the employees of the Department in these surveys and have shown them to be more sensitive in the detection of radiation.

Response to Item 6

It has been Neutron Products practice to conduct comprehensive monthly surveys of the unrestricted areas of the facility. The last monthly survey was conducted on June 29, 1988 and the July monthly survey will be conducted July 30, 1988.

Response to Item 7

Part 5.2 of Procedure R-1003 has been modified as follows.

5.2 Exit

- 5.2.1 Prior to exiting the Limited Access Area (LAA) all protective clothing shall be removed and placed in appropriate containers.
- 5.2.2 Depending on what was done in the LAA (which governs the amounts and locations of potential contamination), each person shall, prior to exiting the LAA wash hands, shower, and/or wash hair, as deemed appropriate. If the possibility of residual contamination is suspected, each person shall frisk with the Ludlum 177 count-rate meter and pancake probe located in the corner of the locker room.
- 5.2.3 Appropriate wash up areas are the sink in the office/lab, the sink and shower stalls in the locker room, and the mop sink near the washing machine. Appropriate agents to use for washing are soap, household detergent (e.g., Mr. Clean), or decontaminating solutions (e.g., Radiac wash or Bypas). Scotch-brite may be used if strong scrubbing is indicated.
- 5.2.4 All objects to be removed from the LAA shall be wipe tested prior to removal. No item having removable contamination in excess of 440 dpm/100 cm² shall be removed unless it is packaged so that the removable surface contamination is less than 440 dpm/100 cm² or its removal is specifically approved by the RS0.

- 5.2.5 Upon leaving the LAA each person and any objects being carried must be screened by the portal monitor. The monitor automatically alarms if contamination is detected.
- 5.2.6 After stepping out of the portal monitor each person shall frisk with the Ludlum 177 count-rate meter and pancake probe. When frisking, move the probe slowly over portions of the body, clothing and objects being carried that may have come in contact with contamination. The meter should be on the xl scale, on slow response, and with the audible signal on. The criterion for whether contamination is present is that the count rate goes to twice or more the background count rate.
- 5.2.7 If contamination is detected by the portal monitor or the frisker, return to the LAA through the entry door, put on shoe covers, and go to one of the locations identified in 5.2.3 and attempt to remove the detected contamination. If assistance is required, call upon the Health Physics Technician or one of the regular employees of the LAA.
- 5.2.8 After completing decontamination efforts, remove and properly dispose of shoe covers and other protective clothing and repeat steps 5.2.5 and 5.2.6. If contamination is still detected, return to the LAA, contact the Radiation Safety Officer (RSO), and wait for instructions.

Response to Item 8

All eating, drinking and smoking in the offices and work areas of the Limited Access Area was terminated on June 29, 1988.


Response to Item 9

The Order 0-88-01 has been posted throughout Neutron Products plant and offices.

We would be pleased to provide any further clarification that might be required.

Very truly yours,

NEUTRON PRODUCTS, INC.



Wayne J. Costley
Vice President
Radiation Safety Officer

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